

**Regional Seminar on Enhancing Service Delivery
by National Meteorological and Hydrological
Services (NMHSs) in Regional Association V
(South-West Pacific)**

(Kuala Lumpur, Malaysia, 2 to 6 April 2007)

Final Report



WORLD METEOROLOGICAL ORGANIZATION

1. OPENING OF THE SEMINAR

1.1 At the kind invitation of the Government of Malaysia, the WMO Regional Seminar on Enhancing Service Delivery by National Meteorological and Hydrological Services (NMHSs) in Regional Association V (South-West Pacific) was held in Kuala Lumpur, Malaysia, from 2 to 6 April 2007. The Seminar was attended by Directors and senior officials of National Meteorological and Hydrological Services (NMHSs) in Region V, and invited lecturers. There were 21 participants from 18 Members, three representatives from non-Members in the Region, two representatives from international/regional organizations, and four invited lecturers. The list of participants and the programme of the WMO Regional Seminar are given in Annex I and Annex II, respectively.

1.2 The first two days of the Seminar was jointly held with the UNESCO Intergovernmental Oceanographic Commission (IOC) Seminar on Tsunami Warning Operations under the Pacific Tsunami Warning and Mitigation System (PTWS), with the theme "Building Capacities of National Meteorological Services and National Disaster Management Offices as Principal Stakeholders for the Timely Issuance of Tsunami Warnings to Prepared Communities". The list of participants and the programme of the IOC Seminar are given in Annex III and Annex IV, respectively. The summary report and recommendations of the IOC Seminar are given in Annex V.

1.3 H.E. Dato' Abdul Hanan Bin Alang Endut, Secretary-General for Ministry of Science, Technology and Innovation extended a very warm welcome to the participants in the IOC Tsunami Seminar and the WMO Regional Seminar, and commended IOC, WMO, the Pacific Islands Applied Geoscience Commission (SOPAC) and the Secretariat of the Pacific Regional Environment Programme (SPREP) for organizing the Seminars, bringing together senior officials of the NMHSs and National Disaster Management Offices (NDMOs) from the Pacific and South China Sea regions, and hoped that the partnership continued to further assist countries to be effective in the delivery of warning services related to natural disasters such as tsunami and hydro-meteorological events. Noting significant progress and efforts taken by the international community to extend warnings to cover the South China Sea region and the establishment of the Indian Ocean Tsunami Warning System (IOTWS), Dato' Hanan emphasized the continuous call for NMHSs to play a more important role in providing weather and climate forecasts, including warnings to support natural disaster prevention and mitigation activities. With emphasis on the priority need for continued enhancement of the observation and communication systems and the investments in capacity building of personnel for hydro-meteorological services, he suggested that WMO and Region V NMHSs look at the model of assessment used by IPCC to see if the lessons learned in these assessments could be used to build the capacity of the next generation of meteorologists in order that they be more adept at applying the weather and climate forecasts to social and economic impact assessments. Dato' Hanan wished all the participants a very successful and fruitful meeting and an enjoyable stay in Malaysia and he officially declared the Seminars open.

1.4 Dr Yap Kok Seng, Permanent Representative of Malaysia with WMO and Director-General of Malaysian Meteorological Department welcomed the participants and expressed his gratitude to WMO, IOC, SOPAC and SPREP for bringing the Seminars to this Region at a very appropriate time to help NMHSs address many current issues encountered in their development planning and implementation of their daily operations.

1.5 The following representatives delivered statements at the opening ceremony:

- Dr Peter Koltermann, Representative of UNESCO/IOC
- Dr Laura Kong, Director, International Tsunami Information Centre (ITIC)
- Dr Tokiyoshi Toya, Representative of WMO
- Mr Arona Ngari, President of WMO Regional Association V (South-West Pacific)
- Mr Noud Leenders, Representative of SOPAC
- Mr Dean Salofa, Representative of SPREP

1.6 Speaking on behalf of Mr Michel Jarraud, Secretary-General of WMO, Dr Tokiyoshi Toya, Regional Director for Asia and the South-West Pacific, expressed his deep appreciation, and that of WMO, to Dato' Abdul Hanan, Secretary-General, Ministry of Science, Technology and Innovation and the Government of Malaysia for hosting the Seminars. He extended his gratitude to Dr Yap Kok Seng, Director-General of the Malaysian Meteorological Department and his staff for the warm hospitality and for the excellent arrangements made to ensure the success of the session. He underlined the importance and timeliness of this combined event in the Region to facilitate the NMHSs and NDMOs to work together with the aim of strengthening partnerships and strategic alliances to deliver and provide accurate, timely and reliable information and warnings of severe events including tsunami to the communities. With a view to strengthening the capacities of NMHSs in the Region to contribute effectively to sustainable development, he wished the Seminars' conclusions and recommendations to be valuable in the development of the regional Strategic Plan for RA V. In closing, Dr Toya assured that WMO would continue to support Members' efforts to mitigate impacts and risks of natural disasters.

1.7 Mr Arona Ngari, president of WMO Regional Association V (South-West Pacific) commended the organizers of these seminars, seeing it fit that meteorologists, seismologists and disaster managers come together and discuss common issues because they have a common goal to mitigate the loss of property and life. In referring to the tsunami event which occurred on the morning of Monday, 2 April 2007 in the Solomon Islands, showing a typical example of vulnerability to such hazards, he stressed the importance of ensuring that such warnings are received by the appropriate people in a timely manner and are correctly understood. He noted that the role of NMHSs for tropical cyclones is vital in conveying the warnings to the communities.

2. SUMMARY OF DISCUSSIONS

2.1 The lectures and case studies were presented by Directors or senior officials of NMHSs, representatives of international/regional organizations, invited lecturers, and staff of the WMO Secretariat. The presentations covered the following topics of the Seminar:

- Topic I: Social and economic benefits of weather, climate and water services
- Topic II: New initiatives for observations and communications
- Topic III: Delivery of accurate and timely weather, climate and related information to end-users
- Topic IV: Strategic planning
- Topic V: Resource mobilization

2.2 Following extensive discussions on the various presentations, the Seminar came to the conclusions and recommendations as given below.

3. SOCIAL AND ECONOMIC BENEFITS OF WEATHER, CLIMATE AND WATER SERVICES (Topic I)

3.1 Dr L. Anderson-Berry (Chair of RA V Working Group on Natural Disaster Prevention and Mitigation) pointed out that the availability and effective use of weather, climate and water information would enable the social and economic costs of hydro-meteorology related disasters to be reduced. Hence, achieving the full potential value of weather, climate and water information service as a resource is the ultimate goal for NMHSs to contribute to national programmes on sustainable development in the areas of agriculture, water resources, human health, nutrition, poverty reduction, tourism, energy, transport, communication, urban settlement, wild fires, financial and economic services. She stressed the importance to develop and/or transform weather, climate and water information and services to address national and local objectives which could be measured and presented to decision and policy makers in economic terms.

3.2 Mr K. Konaré (WMO) introduced and commented on the issue of social and economic benefits of weather, climate and water services with a focus on the outcomes of the International Conference on Secure and Sustainable Living (Madrid, Spain, 10-22 March 2007), in particular, the Madrid Conference Statement and the related Madrid Action Plan. He stressed the important input made to the Conference through the outcomes of the various workshops on the socio-economic benefits of meteorological and related services to society, organized by WMO prior to the Conference. He elaborated on the topics of estimating benefits of weather, climate and water services and delivering services in developing countries from NMHSs perspective.

3.3 Mr C. Iroi (Solomon Islands) informed the meeting of the use of weather and climate information for social and economic development in the Solomon Islands, underscoring NMHSs proactive role in engaging stakeholders to identify their needs for weather, climate and water information services.

3.4 Ms M. Ngemaes (Palau) briefed the meeting on recent developments in the Palau Weather Service Office (WSO), including the relocation and construction of a new office building.

3.5 Mr E. Santoso (Indonesia) presented an example on the use of weather information for natural disaster reduction in Indonesia.

3.6 Mr R. Togiamana (Niue) informed the meeting of the tsunami warning and response in Niue, as well as highlighting experiences during tropical cyclone Heta. The Niue Meteorological Service is the national focal point for tsunami warning, as approved by the Government in June 2006.

3.7 Mr D. Aranug (Federated States of Micronesia) gave a presentation on tsunami warning and response in the Federated States of Micronesia. The Weather Service Office is the focal point for tsunami warning.

3.8 Prof. M. Ratag (Indonesia) presented the current status of the Indonesia Tsunami Early Warning System, lessons learned, and how to educate the public and to enhance public awareness and preparedness.

3.9 The Seminar made the following recommendations:

- The evaluation of the social and economic benefits of weather, climate and water services should be considered as an ongoing process by NMHSs through dialogue with partners and users of these services, including governments.
- The implementation of the Madrid Action Plan should be featured into WMO constituent bodies decisions as appropriate.
- WMO and Members should establish a process to develop common understanding and methodologies on the evaluation of social and economic benefits of weather, climate and water information and services.
- NMHSs should develop their capacities in collaborative relationships with partners, as well as their communication and marketing strategies, with the aim to enable them to transform and communicate weather, climate and water information and services into decision and policy making at all levels, including risk management, and building strategic partnerships to address national and local objectives.
- NMHSs should take a proactive and leading role to enhance the service delivery through better interaction between producers and users of weather, climate and water information and services, and to develop the knowledge of personnel in social and economic issues.

- WMO and Members should make an assessment of the costs of NMHSs modernization programmes versus economic risk related to meteorological and hydrological systems and develop methodologies for measuring the benefits of the services provided by NMHSs in various socio-economic sectors.

4. NEW INITIATIVES FOR OBSERVATIONS AND COMMUNICATIONS (Topic II)

4.1 Mr T. Hart (Chair of the Working Group on the Planning and Implementation of WWW in Region V) pointed out that the WMO Commission for Basic Systems is responsible for the development of the infrastructure underpinning the service delivery by NMHSs. CBS held an Extraordinary Session in November 2006. WMO has endorsed an Implementation Plan for the Evolution of the Global Observing System and CBS is responsible for the progression of the plan. The plan envisages an *Integrated Observing System* comprising both surface-based and space-based sub-systems. CBS and the RA V session in May 2006 noted the need to develop a version of the global plan that applies to RA V. The Plan should consider the utilization of space-based observations and respond to recommendations for developing surface-based observations. In regard to communication, the major development is the WMO Information System (WIS). Building blocks have been developed and prototypes demonstrated. The timetable expects the first global centre to be operational by mid-2008. The WIS offers many benefits to NMHSs in RA V.

4.2 Mr E. Young (USA) presented the work of the Pacific Communication Committee that has been carried out during the past years, as well as ways to develop partnerships for future development of telecommunication systems for the dissemination of warnings to the communities.

4.3 Mr M. Tibiriano (Kiribati) requested the meeting to find ways to assist in providing basic conventional observing equipment, such as thermometers and barometers for Kiribati.

4.4 Ms I. Che Gayah (Malaysia) pointed out that the Government of Malaysia has requested the Malaysian Meteorological Department to include social and economic impact assessment, and climate change as part of its activities. This has raised a number of issues such as the lack of decision support tools, staff not possessing the multi-disciplinary knowledge and the limited availability of detailed short-range climate forecasts which the Malaysian Meteorological Department needs to address in order to define the additional responsibilities.

4.5 Mr L.Z. Jacklick (Marshall Islands) presented the utilization of the various functions of the Internet, such as communication platform, data quality controlling and assessment tools, forecasting and severe weather warnings.

4.6 The Seminar made the following conclusions and recommendations:

- Since NMHSs in RA V value the information on ocean surface winds provided by the QuikScat satellite, the Seminar requested that such capability be continued in the Space-based sub-system of the Global Observing System (GOS). Members would welcome a successor to QuikScat and are encouraged to take full benefit of these observations in their services.
- RA V Members should note the request from WMO Executive Council to implement the plan for the evolution of the GOS and contribute, where possible, to the enhancement of the GOS such as through: distribution of observations not currently exchanged; provision of radiosonde observations at full vertical resolution; maintenance of the baseline system (RBSN) especially upper-winds in the tropics; expansion of AMDAR observations within the Region; installation of Automatic Weather Stations (AWS); and further investigation of inexpensive lightning detection systems and contribution to a global system, if this is feasible.

- RA V Members should continue to contribute to the development of the WMO Information System (WIS) and consider the potential application to their own services and to other national and regional organizations.
- There are potential simple systems to operate and economical telecommunication systems available on the market, which NMHSs could utilize to disseminate weather, climate and water information services, including warnings to the communities; and WMO should provide information on these systems and the suppliers, as well as information on potential collaborating partners who would be willing to provide the resources to realize the installation of these systems, especially in SIDS and LDCs.
- Some RA V Members, in particular SIDS and LDCs, are facing difficulties in maintaining basic observing programmes. Therefore, WMO should assist them in the provision of the required equipment, calibration and other needs.
- RA V Members should utilize sustainable observation and telecommunication systems.
- A two-way telecommunication potential would be available on WAFS, however, current arrangements would not make this possible. The meeting recommended that Members consider through ICAO making the required changes to enable WAFS to have a two-way telecommunication to benefit both the Civil Aviation Authority (CAA) and NMHSs.
- NMHSs, especially those in SIDS and LDCs, should enhance the utilization of various functions available through the Internet such as communication platform, data quality controlling and assessment tools, forecasting and severe weather warning products.
- NMHSs are encouraged to further develop and enhance early warning capabilities to meet local requirements.
- RA V Members should request CBS to review the products routinely produced by the newly designated Global Producing Centres for Long-range Forecasts to ensure that they respond to evolving users' requirements. For example, RA V Members should invite these Centres to make monthly forecasts available where skills have been demonstrated.

5. DELIVERY OF ACCURATE AND TIMELY WEATHER, CLIMATE AND RELATED INFORMATION TO END-USERS (Topic III)

5.1 Mr C. Pearson (Chair of RA V Working Group on Hydrology and Regional Hydrological Advisor to the President of RA V) noted that NMHSs are challenged to manage natural and human-induced issues and emergencies, now and in the future, and this requires planning to have the necessary capability within NMHSs and connection with key stakeholders. Sustainable capability will be driven by addressing the issues of the end-users. The key challenges ahead include those associated with climate change, flood and drought forecasting, freshwater quality (rivers and aquifers), coastal inundation (storm surge, tsunami, sea-level rise), urbanization and development, irrigation, water supply, waste water, integrated catchment management, energy (renewables: hydropower, wind, solar), and the environment. All of these challenges interact and compound, and NMHSs in RA V are struggling to handle these challenges. Furthermore, connections between meteorological and hydrological services become strained and complicated when looking at issues affecting stakeholders. In fact, in most cases in RA V, the "NHMS" concept is virtual with NMSs and NHSs mainly being separate agencies, with the connections becoming fragmented under the above challenges. Three-year WMO/SOPAC Pacific-HYCOS was seen as one of the initiatives to help address some of these issues.

5.2 Mr T. Hart (Chair of the Working Group on Planning and Implementation of WWW in Region V) described graphical forecast products used in the Australian Bureau of Meteorology for enhancing severe weather services such as the new high-resolution display from Doppler

radar, thunderstorm forecasts and warnings, and new graphical tropical cyclone track map with past and future track, as well as showing threat areas and areas of uncertainty in the forecast tracks.

5.3 Mr N. Beriot (New Caledonia) provided information on new products and methods used or under development in New Caledonia, such as vigilance charts, and charts related to risks of bush fire and heavy rainfall.

5.4 Mr S. Maiha (Papua New Guinea) discussed the current development efforts towards enhancing weather and climate services to benefit communities with respect to natural hazards. He introduced the background on Papua New Guinea National Weather Service, Papua New Guinea's mining and oil based economy and the potential contributions of meteorological services to the development of a more sustainable economy.

5.5 Dr P. Nilo (Philippines) presented an example of a locally tailored climate information monitoring and prediction service for agriculture in the Philippines. He introduced the framework for the transition of global climate forecasts and flow of information from producers to end-users, the use of "end-to-end approach", bridging the gaps between seasonal forecasts and decision-makers in the agriculture sector such as rice procurement, importation and storage and dry land corn production.

5.6 Prof. M. Ratag (Indonesia) pointed out that the usefulness of weather, climate and water information has been for the most part a by-product of hydro-meteorological scientific advancement rather than a communication and collaboration between the NMHSs and those using the products. Recent experiences with weather-, climate- and water-related risk management, including tsunami have demonstrated that the sciences of hydro-meteorological and geological events that are intended to support decision and policy making are effective and useful when implemented in a system or procedure incorporating the needs and views of those who would use the information, with guidance and proactive leadership role of NMHSs.

5.7 Mr J. Mala (Vanuatu) briefed the meeting on the progress of development to enhance services delivery in Vanuatu. He introduced the conventional activities and concluded with new ways to enhance the delivery of services and the visibility of the Vanuatu Meteorological Service.

5.8 Mr A. Ngari (Cook Islands) informed the meeting on the way they have implemented the Quality Management System (QMS) in meeting the requirements of the New Zealand Civil Aviation Authority. The QMS was carried in-house with some examples obtained from other NMSs such as Singapore and New Zealand. The collaborative effort among regional and international organizations is seen as an advantage in implementing such QMS and Certification for Aviation Meteorology in Member States.

5.9 Mr O. Fa'anunu (Tonga) underlined the requirements for the implementation of a QMS in line with the WMO/ICAO guidelines. He emphasized the importance of QMS in enhancing service delivery and opening up opportunities for the National Meteorological Service at the national level.

5.10 Ms C.L Wong (Singapore) presented the core services (civil aviation weather service, public weather services, specialized services and climatic information services) of the Meteorological Services Division of Singapore, and the enhancement of the delivery of these services to end-users by the use of E-Services.

5.11 Ms A. Abdul Rahman (Brunei Darussalam) briefed the meeting on the challenges faced by Brunei Meteorological Service in delivering the weather forecast information, especially warnings to the end-users. She introduced the various users and the different types of weather and climate information they require, stressing the challenges encountered in the delivery of the services.

5.12 The Seminar made the following conclusions and recommendations:

- NMHSs should enhance their sustainable capability to deliver accurate and timely weather, climate and water services that should be driven by the requirements of end-users.
- Climate variability related water issues are becoming frequent due to ENSO phenomena. RA V Members should address water-related issues in a coordinated manner, requiring a very close collaboration and interaction of hydrology and meteorology disciplines.
- More integration of NMS and NHS services should be made through connected Standard Operational Procedures (SOPs), particularly for flood forecasting, water resources management and drought prediction.
- An examination of NHMS' capabilities, particularly in the areas of staff, infrastructure, SOPs and communications, to meet increasing demands and challenges should be included as an action point in the RA V Strategic Plan.
- Relationships should be enhanced between NMHSs in RA V and regional organizations and their plans (e.g., SOPAC Regional Strategy for Enhancing Early Warning for Pacific Island Countries) to assist in securing funding for projects, education, training, and workshops.
- NMHSs should introduce innovative approaches towards demonstrating the benefits of meteorological and hydrological services to support national sustainable development.
- NMHSs should explore opportunities in institutional arrangements to better achieve NMHSs goals to support national sustainable development/social, economic and environment priorities.
- NMHSs should work closely with major national economic sectors to provide hydro-meteorological services and information to enhance decision-making. A process for the economic valuation of the decisions, with and without weather and climate information, should be developed.
- WMO and Members in collaboration with ICAO should continue to support the implementation of QMS for RA V Members who provide services to international air navigation.

6. STRATEGIC PLANNING (Topic IV)

6.1 Mr A. Ngari (Cook Islands) briefed the meeting on the WMO Strategic Plan, which provides the basis for the development of the RA V Strategic Plan.

6.2 Mr G. Foley (Australia) introduced the background and basic principles of strategic planning with the aim of generating ideas towards the development of the RA V Strategic Plan. He concluded by stressing the importance of the implementation of the Plan.

6.3 Mr N. Beriot (New Caledonia) informed the meeting of Météo-France four-year Contract Plan and its application to New Caledonia. He stressed the importance of partnership through contracts and cooperation in the implementation of the Plan.

6.4 Mr R. Prasad (Fiji) presented a paper on meteorological data exchange and charging policy considerations. He emphasized the requirements for free and unrestricted data exchange as per WMO Resolution 40 (Cg-XII) and Resolution 25 (Cg-XIII) and introduced the rationale and application for cost recovery.

6.5 Mr S. Tuiafiso (Samoa), in concluding the presentation, recommended for WMO to support NMHSs in SIDS and LDCs for the identification of meteorological aspects that would

greatly assist in the formulation of national policy particularly in relation to sustainable development, Meteorological Act, for the advancement of public welfare and safety through forecasts and longer-term outlooks derived from data observation and research, and the formulation of social and economic benefits to meteorological services.

6.6 Mr M. Tibiriano (Kiribati) informed the meeting of the work of the Kiribati Meteorological Services, and requested WMO and any resources available in the Region to assist them to continue strengthening their capacities.

6.7 Mr T. Katea (Tuvalu) presented Tuvalu Meteorological Strategic Plan 2007-2011. He introduced the background and organizational structure of the Service, as well as its vision.

6.8 The Seminar made the following conclusions and recommendations:

- The Task Team on Strategic Planning should continue to progress the Strategic Plan with the aim of presenting a final document to the president of RA V prior to the next WMO Congress.
- The Strategic Plan should generate a series of detailed action plans in order to work towards its full implementation. RA V Management Group should assign teams to address these action plans.
- WMO and Members should assist NMHSs in convincing Governments of the importance of having Meteorological Act or equivalent to guide the Meteorological Services in performing their roles and responsibilities.
- WMO should assist NMHSs in SIDS and LDCs in the identification of meteorological and hydrological aspects that would greatly assist in formulation of a national policy, particularly in relation to sustainable development.
- WMO and Members should support capacity building for observers and forecasters in SIDS and LDCs.

7. RESOURCE MOBILIZATION (Topic V)

7.1 Dr T. Toya (WMO) introduced various measures taken by the Secretary-General to strengthen the WMO resource mobilization activities, including the establishment of the Secretariat steering committee on resource mobilization to develop and implement WMO policy and strategy for resource mobilization, and of the trust fund for resource mobilization activities; and the organization of the Development Cooperation and Regional Activities Department to provide improved services to Members through enhanced resource mobilization for development activities and more active involvement of Regional Offices and WMO Offices in the Region. The meeting was briefed on the Action Plans of the Resource Mobilization Office and the Regional Office for Asia and the South-West Pacific, and reviewed the progress on the RA V Members' actions recommended by the last Regional Seminar (Tonga, December 2003). The Seminar agreed that the recommendations from the Tonga Seminar be considered for inputs to the regional Strategic Plan for RA V.

7.2 Dr V. Tsui (Australia) noted that there are three common ways to mobilize resources: government appropriation; sale of goods and services (cost recovery, commercial services); and in-kind contributions by donor agencies (e.g., equipment, software, spares, consumables, fellowships, and secondment of staff). It was agreed that the most reliable and sustainable source is from the Government. The key to justify additional funding support is to link the role of meteorological services to disaster prevention and mitigation. After studying the organization and functions of the Caribbean Meteorological Organization (CMO) and considering the available talents and potentials of the Pacific Island Countries, the meeting agreed that the concept of a similar Pacific Meteorological Organization (PMO) could be further explored.

7.3 Mr N. Beriot (New Caledonia) informed the meeting of the budget structure of Météo-France, including New Caledonia and Wallis & Futuna. He stressed the importance to optimize the use of existing resources, to protect the rights on data, to protect the core missions of the service as well as to be innovative in the sectors open to commercial competition.

7.4 Mr S. Tuiafiso (Samoa) presented Samoa's experience in resources mobilization, including making use of existing resources, opportunities and partnerships. He informed the meeting of the national framework and the NMHS Strategic Plan 2005-2010.

7.5 The Seminar recommended that WMO should arrange an overview presentation by a representative of the Caribbean Meteorological Organization (CMO) during Fifteenth Congress (Geneva, May 2007) to Pacific Island Country delegates, so that a decision could be made at the Twelfth Meeting of Regional Meteorological Service Directors (RMSD) (Rarotonga, July 2007) on whether further work should be carried out in preparation for the establishment of a Pacific Meteorological Organization (PMO).

7.6 The Seminar requested the RA V Management Group to explore ways of resource mobilization in the implementation of the WMO Strategic Plan.

7.7 A special session was held to brief the progress on the implementation of the WMO Programme for LDCs and SIDS. The meeting agreed that elements of the RA V Strategic Plan should enhance the implementation of this programme.

8. CLOSURE OF THE SEMINAR

8.1 The Seminar reviewed and adopted the draft Report.

8.2 The participants, the president of Regional Association V and the representative of WMO expressed their thanks and appreciation to the Government of Malaysia and the Ministry of Science, Technology and Innovation for the successful hosting of the Seminar. They also expressed gratitude to Dr K.S. Yap and his staff for the warm hospitality and excellent arrangements made.

8.3 The Seminar closed at 13:30 hours on 6 April 2007.

**Regional Seminar on Enhancing Service Delivery by National
Meteorological and Hydrological Services (NMHSs) in Regional
Association V (South-West Pacific)
(Kuala Lumpur, Malaysia, 2 to 6 April 2007)**

LIST OF PARTICIPANTS

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**Regional Seminar on Enhancing Service Delivery by National
Meteorological and Hydrological Services (NMHSs) in Regional
Association V (South-West Pacific)**

(Kuala Lumpur, Malaysia, 2 to 6 April 2007)

PROGRAMME

MONDAY, 2 APRIL 2007

Morning

- 08:00 - 09:00 Registration
09:00 - 10:00 IOC Seminar on Tsunami Warning Operations
10:00 - 11:30 Opening Ceremony
11:30 - 11:45 Coffee Break
11:45 - 12:45 IOC Seminar on Tsunami Warning Operations
12:45 - 14:00 Lunch

Afternoon

- 14:00 - 16:00 IOC Seminar on Tsunami Warning Operations
16:00 - 16:15 Coffee Break
16:15 - 18:30 IOC Seminar on Tsunami Warning Operations

TUESDAY, 3 APRIL 2007

Morning

- 08:30 - 10:00 IOC Seminar on Tsunami Warning Operations
10:00 - 10:15 Coffee Break
10:15 - 12:15 IOC Seminar on Tsunami Warning Operations
12:15 - 13:30 Lunch

Afternoon

- 13:30 - 15:15 IOC Seminar on Tsunami Warning Operations
15:15 - 15:30 Coffee Break
15:30 - 17:00 IOC Seminar on Tsunami Warning Operations

WEDNESDAY, 4 APRIL 2007**Morning**

- 09:00 - 09:10 General introduction
Dr T. Toya (WMO)
- TOPIC I - THE SOCIAL AND ECONOMIC BENEFITS OF WEATHER, CLIMATE AND WATER SERVICES**
- Chair: Dr K.S. Yap (Malaysia)**
Rapporteur: Mr E. Young (United States of America)
- 09:10 - 09:40 The Social and Economic Benefits of the Weather, Climate and Water Services
Dr L. Anderson-Berry (Chair, Working Group on Natural Disaster Prevention and Mitigation)
- 09:40 - 10:10 The Issue of Social and Economic Benefits of Weather, Climate and Water Services
Mr K. Konaré (WMO)
- 10:10 - 10:25 Use of Weather and Climate Information for Socio-Economic Development in Solomon Islands
Mr C. Iroi (Solomon Islands)
- 10:25 - 10:40 Enhancing the Delivery of Weather Information at Palau International Airport
Ms M. Ngemaes (Palau)
- 10:40 - 10:55 Coffee Break
- 10:55 - 11:10 Weather Information for Natural Disaster Reduction in Indonesia
Mr E. Santoso (Indonesia)
- 11:10 - 11:25 Tsunami Warning and Response in Niue
Mr R. Togiamana (Niue)
- 11:25 - 11:40 Tsunami Warning and Response in the Federated States of Micronesia
Mr D. Aranug (Federated States of Micronesia)
- 11:40 - 11:55 Present Status of the Indonesia Tsunami Early Warning System (InaTEWS)
Prof. M. Ratag (Indonesia)
- 11:55 - 12:30 Discussions and recommendations on Topic I
- 12:30 - 14:00 Lunch Break

WEDNESDAY, 4 APRIL 2007**Afternoon****TOPIC II - NEW INITIATIVES FOR OBSERVATIONS AND COMMUNICATIONS****Chair: Mr A. Ngari (Cook Islands)****Rapporteur: Mr N. Beriot (New Caledonia)**

- 14:00 - 14:30 Innovations in Observations and Communications in the World Weather Watch
Mr T. Hart (Chair, Working Group on Planning and Implementation of WWW in Region V)
- 14:30 - 15:00 Short- and Long-Term Partnering Strategies for Improving Communications/Dissemination for Pacific Island NMHSs
Mr E. Young (United States of America)
- 15:00 - 15:15 Observations and Communications
Mr M. Tibiriano (Kiribati)
- 15:15 - 15:30 Delivery Service Systems at Malaysian Meteorological Department
Ms I. Che Gayah (Malaysia)
- 15:30 - 15:45 The Internet "Expanding a Small Island NMS's Horizon"
Mr L.Z. Jacklick (Marshall Islands)
- 15:45 - 16:15 Discussions and recommendations on Topic II
- 16:15 - 16:30 Coffee Break

Afternoon**TOPIC III - DELIVERY OF ACCURATE AND TIMELY WEATHER, CLIMATE AND RELATED INFORMATION TO END-USERS****Chair: Mr R. Prasad (Fiji)****Rapporteur: Mr S. Maiha (Papua New Guinea)**

- 16:30 - 17:00 Sustainable Capability of Weather, Climate and Water Services in RA V
Mr C. Pearson (Regional Hydrological Advisor)
- 17:00 - 17:15 New Graphical Forecast Products used in the Bureau of Meteorology for Enhancing Severe Weather Warning Services
Mr T. Hart (Chair, Working Group on Planning and Implementation of WWW in Region V)
- 17:15 - 17:30 Closer to the Users of Weather and Climate Services in New Caledonia
Mr N. Beriot (New Caledonia)
- 17:30 - 17:45 Widening the Scope and Enhancing Meteorological and Climate Services in Papua New Guinea
Mr S. Maiha (Papua New Guinea)
- 17:45 - 18:00 Initiatives on Locally-tailored Climate Information Services in the Philippines
Dr P. Nilo (Philippines)

THURSDAY, 5 APRIL 2007**Morning****TOPIC III - DELIVERY OF ACCURATE AND TIMELY WEATHER, CLIMATE AND RELATED INFORMATION TO END-USERS (continued)****Chair: Mr R. Prasad (Fiji)****Rapporteur: Mr S. Maiha (Papua New Guinea)**

09:00 - 09:15 High Resolution Climate Modelling in Indonesia: Lessons Learned from Regency/District Scale Applications

Prof. M. Ratag (Indonesia)

09:15 - 09:30 Enhancing Service Delivery in Vanuatu

Mr J. Mala (Vanuatu)

09:30 - 09:45 Certification Process for Cook Islands Meteorological Services to Meet ICAO Regulations

Mr A. Ngari (Cook Islands)

09:45 - 10:00 Requirements for establishing a Quality Management System

Mr O. Fa'anunu (Tonga)

10:00 - 10:15 Enhancing the Delivery of Weather and Climate Information to End-Users

Ms C.L. Wong (Singapore)

10:15 - 10:30 Getting the Message Across – Brunei Experiences

Ms A. Abdul Rahman (Brunei Darussalam)

10:30 - 10:45 Discussions and Recommendations on Topic III

10:45 - 11:00 Coffee Break

TOPIC IV - STRATEGIC PLANNING**Chair: Mr C. Iroi (Solomon Islands)****Rapporteur: Mr G. Foley (Australia)**

11:00 - 11:30 Overview of Strategic Planning for RA V

Mr A. Ngari (Cook Islands, president of RA V)

11:30 - 12:00 Strategic Planning

Mr G. Foley (Australia, Chair of Task Team on the RA V Strategic Plan)

12:00 - 12:15 Increasing interactions with our environment

Mr N. Beriot (New Caledonia)

12:15 - 12:30 Meteorological Data Exchange and Charging Policy Considerations

Mr R. Prasad (Fiji)

12:30 - 14:00 Lunch Break

THURSDAY, 5 APRIL 2007**Afternoon****TOPIC IV - STRATEGIC PLANNING (continued)**

Chair: Mr O. Fa'anunu (Tonga)
Rapporteur: Mr G. Foley (Australia)

- 14:00 - 14:15 Strategic Planning for Samoa Meteorological Services
Mr S. Tuiafiso (Samoa)
- 14:15 - 14:30 Strategic Plan 2007-2009
Mr M. Tibiriano (Kiribati)
- 14:30 - 14:45 Strategic Planning of Tuvalu Meteorological Service 2007-2011
Mr T. Katea (Tuvalu)
- 14:45 - 15:15 Discussions and recommendations on Topic IV
- 15:15 - 15:30 Coffee Break

TOPIC V - RESOURCE MOBILIZATION

Chair: Mr M. Tibiriano (Kiribati)
Rapporteur: Dr P. Nilo (Philippines)

- 15:30 - 16:00 WMO Resource Mobilization
Dr T. Toya (WMO)
- 16:00 - 16:30 Resource Mobilization for Pacific Island Countries
Dr V. Tsui (Australia)
- 16:30 - 16:45 Seeking new and additional resources
Mr N. Beriot (New Caledonia)
- 16:45 - 17:00 Resource Mobilization in Samoa Meteorology Services
Mr S. Tuifiso (Samoa)
- 17:00 - 17:30 Discussions and recommendations on Topic V

FRIDAY, 6 APRIL 2007**Morning**

- 08:30 - 10:00 **MEETING OF THE TASK TEAM ON THE RA V STRATEGIC PLAN (Part I)**
- 10:00 - 10:30 Special Session on the Least Developed Countries (LDCs) and Small Island Developing States (SIDS)
- 10:30 - 11:00 Coffee Break
- 11:00 - 13:30 **Chair: Dr K.S. Yap (Malaysia)**
Review and adoption of the Report and Closure of the Seminar
- 13:30 - 14:30 Lunch Break

Afternoon

- 14:30 - 16:00 **MEETING OF THE TASK TEAM ON THE RA V STRATEGIC PLAN (Part II)**
- 16:00 - 18:00 Technical visit to the Malaysian Meteorological Department
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**SEMINAR ON TSUNAMI WARNING OPERATIONS UNDER THE PACIFIC TSUNAMI
WARNING AND MITIGATION SYSTEM (PTWS): PROTOCOLS, PROCEDURES AND
BEST PRACTICES FOR MONITORING, EVALUATION AND ALERTING THE PUBLIC**

Theme

“Building Capacities of National Meteorological Services and
National Disaster Management Offices as Principal Stakeholders
for the Timely Issuance of Tsunami Warnings to Prepared Communities”

(Kuala Lumpur, Malaysia, 2 to 3 April 2007)

(Co-sponsored by IOC PTWS, WMO, SOPAC, SPREP)

Last Name	First Name	Position	Country	Organization
Anderson-Berry	Dr Linda		Australia	BOM
Foley	Mr Gary		Australia	BOM
Hart	Mr Terry		Australia	BOM
Tsui	Dr Venantius		Australia	BOM
Abdul Rahman	Ms Asraya		Brunei	NMHS
Awang Kachi	Mr Noor Aflan	Station Officer	Brunei	National Disaster Management Centre
Haji Ibrahim	Mr Sallehuddin	Senior Supt.	Brunei	National Disaster Management Centre
Han	Mr Lei		China	China Earthquake Administration
Wei	Mr Wu		China	National Marine Environment Forecasting Centre
Wong	Mr Wing-Tak		China	Hong Kong Observatory
Carlson	Mr Charlie		Cook Islands	Emergency Management Cook Islands
Ngari	Mr Arona	Director	Cook Islands	NMHS, PTWS National Contact, TWFP
Prasad	Mr Rajendra	Director	Fiji	Fiji Meteorological Service
Pariatmono	Dr		Indonesia	Ministry of Research and Technology
Ratag	Prof. Mezak A.		Indonesia	BMG
Santoso	Mr Endro		Indonesia	BMG
Sunarjo	Dr	Director	Indonesia	BMG, Geophysical data and Information System
Igarashi	Mr Yosuke	Chief	Japan	Japan Meteorological Agency, International Tsunami Information Section, Earthquake and Tsunami Observations Division, Seismological and Volcanological Department
Tibiriano	Mr Moreti		Kiribati	NMHS
Badrulshah Mohd Idris	Mr		Malaysia	National Security Division
Che Abas	Dr Modh Rosaidi	Director, Seismological Division	Malaysia	Malaysian Meteorological Department

Isamail	Ms Che Gayah	Deputy Director	Malaysia	Malaysian Meteorological Department
Thean Shong	Mr Kang		Malaysia	Malaysian Meteorological Department
Umar	Mr Che Moin	Director	Malaysia	Crisis and Disaster Management Directorate, IOTWS WG6 Chair
Jacklick	Mr Lee		Marshall Islands	NMHS
Aranug	Mr David	Officer-in-Charge	Micronesia (FSM)	NMHS
Marchi-Leccia	Colonel Frédéric	Director	New Caledonia	Service de la Sécurité Civile, High-Commissioner of France, New Caledonia
Beriot	Mr Nicholas	Director	New Caledonia, Wallis-and-Futuna	NMHS
Coetzee	Mr David		New Zealand	Ministry of Civil Defence and Emergency Management
Pearson	Mr Charles		New Zealand	NMHS
Tongiamana	Mr Robert	Senior Sergeant, Police	Niue	Police Headquarters, NDMO Officer
Ngemaes	Ms Maria	Officer-in-Charge	Palau	NMHS
Maiha	Mr Samuel		Papua New Guinea	NMHS
Moiho	Mr Mathew		Papua New Guinea	Geophysical Observatory, GSPNG
Nilo	Dr Prisco		Philippines	PAGASA
Solidum	Dr Renato, Jr	Director	Philippines	Philippine Institute of Volcanology & Seismology (PHIVOLCS)
Fasavalu	Mr Saolotoga		Samoa	Disaster Management Office
Talia	Mr Lameko		Samoa	Samoa Meteorological Division
Tuiafiso	Mr Sagato		Samoa	NMHS
Wong	Ms Chin Ling	Chief Meteorological Officer	Singapore	Meteorological Services Division, NEA, PTWS National Contact, TWFP
Iroi	Mr Chanel		Solomon Islands	NMHS
Yates	Mr Loti		Solomon Islands	National Disaster Management Office
Tatong	Mr Tinnakorn	Chief Information Dissemination	Thailand	NDWC
Ioane	Mr Makalio		Tokelau	Tokelau Affairs
Fa'anunu	Mr 'Ofa	Director	Tonga	Tonga Meteorological Service
Takai	Mr Mailu	Director	Tonga	National Emergency Management Office
Katea	Mr Tauala		Tuvalu	NMHS
Silu	Mr Sumeo	Disaster Coordinator	Tuvalu	National Disaster Management Office
McCreery	Dr Charles	Director	USA	Pacific Tsunami Warning Center
Young	Mr Edward	Deputy Director	USA	National Weather Service
Mala	Mr Joe		Vanuatu	Vanuatu Meteorological Service, TWFP
Esau	Mr Job	Director	Vanuatu	NDMO
Thai	Dr Tran Hong		Vietnam	Centre for Advanced Technology Application, National Institute of Meteorology, Hydrology and Environment
Tambunan	Dr Donald	Assistant Director	ASEAN	Head of Science & Technology Unit, Association of Southeast Asian Nations

Elliott	Mr Tony	Head	IOC	Tsunami Unit - IOTWS Secretariat
Koltermann	Dr Peter	Head	IOC	Tsunami Unit - Paris
Kong	Dr Laura	Director, Head	IOC	Tsunami Unit - International Tsunami Information Centre, PTWS Secretariat
Yamamoto	Mr Masahiro	Senior Tsunami Advisor	IOC	Tsunami Unit - Paris
Leenders	Mr Noud	Associate Expert in Risk Analysis	SOPAC	Pacific Islands Applied Geoscience Commission
Solofa	Mr Dean	PI-GCOS Coordinator	SPREP	Pacific Regional Environmental Programme
Toya	Dr Tokiyoshi	Regional Director	WMO	Regional Office for Asia and the South-West Pacific
Shida	Mr Kuniyuki	Programme Manager	WMO	Regional Office for Asia and the South-West Pacific
Taiki	Mr Henry	Programme Officer	WMO	WMO Office for and the South-West Pacific

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BEST PRACTICES FOR MONITORING, EVALUATION AND ALERTING THE PUBLIC**

Theme

“Building Capacities of National Meteorological Services and
National Disaster Management Offices as Principal Stakeholders
for the Timely Issuance of Tsunami Warnings to Prepared Communities”

(Kuala Lumpur, Malaysia, 2 to 3 April 2007)

(Co-sponsored by IOC PTWS, WMO RAV, SOPAC, SPREP)

(Funding support from WMO, USA, SOPAC, IOC)

(Hosted by Malaysia Meteorological Department)

Agenda

Day 1: MONDAY, 2 APRIL 2007

TIME	TOPIC	SPEAKER
08:00 - 09:00	Registration	
09:00 - 09:15	Provisional Agenda and Goals of Seminar	ITIC, Laura Kong
09:15 – 10:00	The Pacific Tsunami Warning and Mitigation System (PTWS) - Overview, Requirements, and Implementations	ITIC, PTWS Secretariat, Laura Kong
10:00 – 11:30	Opening ceremony	Malaysia, IOC, WMO, SOPAC, SPREP
11:30 – 11:45	Coffee Break	
11:45 – 12:15	Science of earthquakes and tsunamis (20 min + discussion)	IOC, Masahiro Yamamoto
12:15 – 12:45	Tsunami Hazard Risk Assessment (20 min + discussion)	PTWC, Charles McCreery
12:45 – 14:00	Lunch	
14:00 - 15:00	Tsunami Warning Centres (TWC)	
	Objectives, Concepts of operation, Standard operating procedures (15 min)	IOC, Masahiro Yamamoto
	Seismic and Sea Level Monitoring, Detection and Evaluation Instrumentation and Methodologies (15 min)	PTWC, Charles McCreery
	25 March 2007 Japan Earthquake and Tsunami (15 min)	JMA, Yosuke Igarashi
	Seismic, Sea level and Alerts - Available Tools (15 min)	ITIC, Laura Kong
15:00 – 16:00	Tsunami Hazards and Warning Timeline Scenarios for the Pacific	
	Southwest Pacific (20 min)	PTWC, Charles McCreery
	Discussion (10 min)	PTWC, JMA, Member States

	South China Sea and Northwest Pacific - Northwest Pacific Tsunami Advisory Center (20 min)	JMA, Yosuke Igarashi
	Discussion (10 min)	PTWC, JMA, Member States
16:00 – 16:15	Coffee Break	
16:15 - 17:15	Tsunami Emergency Response (TER) after warning issuance	
	Concept of Operations and standard operating procedures for "End to End" Response Process; Conducting public coastal evacuations; Stakeholder coordination and communication, roles, jurisdictions for government, non-government, and private sector (15 min)	ITIC Laura Kong
	Communication technologies for warning dissemination and public alerts - Satellites (EMWIN/RANET), Radios/Sirens, Cell phones, Communications to Last Kilometer (RANET) (15 min)	USA NWS, Ed Young
	Drills and exercises: Types, Planning, Conduct; International (Exercise Pacific Wave), National, Local (15 min)	ITIC Laura Kong
	Discussion (15 min)	
17:15 – 17:45	TWC, TER, and Media (15 min + video)	IOC, Laura Kong, Masahiro Yamamoto
17:45 – 18:15	Tsunami Mitigation – Education, Outreach, Mitigation Countermeasures	ITIC, Laura Kong
18:15 – 18:30	Discussions	All

Day 2: TUESDAY, 3 APRIL 2007

TIME	TOPIC	SPEAKER
08:30 – 08:45	Agenda and Goals for Day 2: Improving the PTWS and National Systems	ITIC
08:45 - 10:00	PTWS Task Team on Messages – Discussion and Customer input: Improving the content, clarity, understanding, and timely dissemination of Message Products issued by warning centres	
8:45-9:15	Overview and TORs of breakout groups	PTWC
9:15-10:00	Breakout Groups: Products, Content, Timeliness and Method of Delivery: What are the problems? What are the causes? What are solutions? Consider implementation costs, national commitments.	Breakout Groups by Topics to discuss, identify, prioritize for action
10:00 - 10:15	Coffee Break	
10:15– 11:30	PTWS Task Team on Message Content (continued)	
10:15-10:45	Report Back	Group Leaders
10:45 - 11:30	Group Discussion	PTWC, ITIC
11:30 – 12:15	Needs for the Future – Where do we want to go? Moving forward from previous workshops for Pacific Island and South China Sea countries	
	Introduction and TORs of breakout groups - review of previous efforts, current status, assessments (prior and future), suggestions / topics for consideration by sub-regional breakout groups; End-to-end Tsunami warning (monitoring, detection, evaluation, alert dissemination, evacuation, all-clear) implementation, and preparedness required for achieving success. PTWS Medium Term Strategy and Implementation Plan (15 min)	ITIC

	South China Sea Overview - International Roundtable, ASEAN SCMG (15 min)	Malaysia, ASEAN
	SOPAC Member States Overview - Regional Strategy, SPTAW, NPTAC (15 min)	SOPAC/ITIC or Samoa
12:15 – 13:30	Lunch	
13:30 – 15:15	How do we get there? Actions and Recommendations Sub-regional working groups, plenary reporting, and discussion South China Sea Pacific Island Countries – south, west, north	Leads: Malaysia, JMA/PTWC, ITIC Leads: Samoa (PTWS SWPTWG Vice-Chair), PTWC/ITIC, SOPAC
13:30-14:45	Breakout Groups: Review, Modify as needed, and Endorse Regional Strategy; Review prior mtg Actions, report if complete or progress made, identify new esp concerning End-to-End TW and preparedness, prioritize by sub-region, and Endorse. Identify practical TWC and NDMO tools Member States should have. Consider implementation costs, national/regional commitments.	
14:45-15:15	Report Back	Group Leaders
15:15 – 15:30	Coffee break	
15:30 – 16:30	How do we get there? Actions and Recommendations (continued)	
15:30-16:15	Discussion, prioritization, and commitment to action	All
16:15-16:30	Summary and Next Steps: Reporting, Development of Proposals, Next meetings	ITIC
16:30 – 17:00	Closing ceremony	

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(Kuala Lumpur, Malaysia, 2 to 3 April 2007)

Summary Report and Recommendations

The Seminar has been a unique opportunity for National Meteorological Services and National Disaster Management Offices to work together on common responsibilities for Tsunami warning and preparedness related matters. There was general consensus that this dialogue should be continued with the key stakeholders for tsunami early warning as well as other warnings.

The Seminar only touched on current documents relevant to both stakeholders, such as the Strategy for Enhancing Early Warning for Pacific Island Countries, facilitated by the Pacific Islands Applied Geoscience Commission (SOPAC) and the IOC consolidated report, Indian Ocean, December 2005 Regional Capacity Building Needs, Table 4-2, Regional Guidance Documents and Capacity-Building Activities. To ensure better communication and sharing of information, it is recommended that one or two stakeholders attend one another's regional meetings: Disaster Managers to attend Regional Meteorological Services Directors (RMSD) meetings (facilitated by SPREP) as well as Meteorological Services Directors represented at the Disaster Management meetings (facilitated by SOPAC). A small group should be formed with both stakeholders represented to bring out two-three issues that can be fed into these meetings. This group would discuss National Early Warning via conference calls organized by NOAA. Outcomes of discussions of this small group should also be brought forward to the next PTWS ICG meeting in Ecuador.

Conclusions and recommendations

The RMSD meeting should be expanded to address the Meteorological Services roles in tsunami warning system, and to work closely with SOPAC and the NDMOs.

There is a need to support the Strategy for Enhancing Early Warning for Pacific Island Countries and engage all stakeholders to work on the implementation.

Further discussion is recommended to achieve a common understanding and use of international, regional, national and local terminology among stakeholders at the various national and international levels.

Countries are encouraged to use common (colour) codes across hazards and common across international and national jurisdictions. At a national level countries are advised to incorporate currently used codes (i.e., colour codes for cyclones) and for development of new warning arrangements.

All countries are to be advised to use and advocate the Metric system.

There is a need to link the PTWC warning for broad areas to subregional zones in national bulletins. A Standard Operational Plan should be put in place for all internationally issued information bulletins.

NDMOs should focus on more collaboration with the Meteorological Services and emphasize on reaching the “last mile”.

Importance should be reiterated for responsible Early Warning agencies to work together to develop and maintain standard local language(s) terminology ready for immediate dissemination in case of Tsunami Warning, Watch, Advisory and Bulletin. The local language information/advice dissemination should be as detailed as possible including advice for appropriate action for the public.

All Pacific Island countries that are not yet officially members of the PTWS ICG, which requires being a member of either IOC or UNESCO, are encouraged to join. It should be ensured that IOC/ITIC contacts the national warning focal point from each country's Foreign Ministry. The official designated agency has the responsibility to act on the messages received by PTWC. This focal point does not necessarily need to be a 24/7 agency since there can be a difference between an official focal point and separate operational warning/response focal point(s). For simplicity purposes this number should be a bare minimum, but redundancy is most important. SOP's and communication between focal point(s) and warning/response agencies should be strengthened.

There is a need for more (numerical) modelling to decide what is the critical size for an island to be termed as “small”, i.e., when does a tsunami go around an island without a run-up (surface area versus bathymetry).

Current Tsunami detection and ground-truthing equipment in the Pacific leaves several gaps in the coverage. Additional equipment and real-time data in these areas is urgently required for the PTWC to obtain more timely and accurate warnings across the Pacific region.

PTWC and National agencies should continue to minimize the errors in Tsunami warnings and refrain from the term “false warnings”.

Both the National Meteorological Services and the National Disaster Management Office will need to continue in their effort to strengthening relationships with the media for effective and people-focussed Early Warning.

Real-time updates of Pacific hazards and disasters should be centralized and in a media where updates can be posted by authorized individuals. SOPAC is currently working on such an (open source) system for the Pacific region together with IFRC, UNDP and UNOCHA, available at www.PacificDisaster.Net (in final stages of test version).

Roles should be clarified for the regional organizations and their working groups to work closer together to assist Pacific Island countries to develop their national tsunami warning system, as well as other hazard warning systems/programmes.

A strategy to establish national tsunami warning capability should be developed. In some cases, countries will be entirely reliant on regional warning centres providing the warning to a national sovereign authority.

Concerning the SW Pacific Tsunami Needs Assessment – it is necessary to ensure that the above issues are addressed when the teams arrive within each country as part of the Australian Tsunami Warning System.